3.3 rules for derivatives

$$\boxed{\frac{d}{dx} x^n = n x^{n-1}}$$

power rule for der.

$$\boxed{\frac{d}{dy} c x^n = n \cdot c\, x^{n-1}}$$

$$\frac{d}{dx}\, 5x^4 = 20x^3$$

sum rule p117

$$y = x^7 + 3x^2$$

$$y' = 7x^6 + 6x$$

$$\frac{d}{dx}\left(x^7 \pm 3x^2\right) = 7x^6 \pm 6x$$

der of sum = sum of der.

prove $\frac{d}{dx} x^n = nx^{n-1}$

$$\lim_{h \to 0} \frac{f(x+h) - f(x)}{h} = \lim_{h \to 0} \frac{(x+h)^n - x^n}{h}$$

$$\lim_{h \to 0} \frac{\cancel{x^n} + nx^{n-1} \cdot h + \frac{n(n-1)}{2} x^{n-2} h^2 + \dots h^n \cancel{- x^n}}{h}$$

$$\lim_{h \to 0} \frac{\cancel{h}\left(nx^{n-1} + \frac{n(n-1)}{2} x^{n-2} h + \dots + h^{n-1}\right)}{\cancel{h}}$$

$f'(x) = nx^{n-1}$

$$\frac{d}{dx}\left(x^5 - 3x^4 + x^3 - 2x^2 + 4x^1 - 5\cancel{x^0}\right)$$

$$5x^4 - 12x^3 + 3x^2 - 4x + 4 + 0$$

$$\frac{d}{dx}\left(\frac{1}{x}\right) = \frac{d}{dx}\, x^{-1}$$

$$= -1x^{-2} = \frac{-1}{x^2}$$

$y = x^3 - x^2 + 1$

eqn tan, normal lines at $x = 2$ $y = 5$

$y' = 3x^2 - 2x$ $\quad y'(2) = 12 - 4 = 8$

tan $y = 8(x-2) + 5$

normal $y = -\frac{1}{8}(x-2) + 5$